Remarks

Claims 1-46 are pending in the above captioned application. Claims 1-46 stand rejected under 35 U.S.C. §102(b) as anticipated by United States Patent No. 5,835,520, entitled VERY NARROW BAND KrF LASER, issued to Das, et al. on November 10, 1998, based upon an application Ser. No. 842,305, filed on April 23, 1997 ("Das"), and under 35 U.S.C. §102(e) as being anticipated by United states Patent No. 6,157,662, entitled F_2 157NM LASER EMPLOYING NEON AS THE BUFFER GAS, issued to Scaggs, et al. on December 5, 2000, based upon an application filed Ser. No. 09/317,526, filed on May 24, 1999, claiming priority to a provisional No. 60/119,960 filed on February 12, 1999 ("Scaggs") and also as anticipated by United States Patent No. 6,560,254, entitled LINE-NARROWING MODULE FOR HIGH POWER LASER, issued to Stamm on May 6, 2003, based upon an application Ser. No. 10/077,327, filed on February 15, 2002 claiming priority to a parent Serial No. 09/694,246, filed on October 23, 2000. The above captioned application claims priority back at least to an application Serial No. 09/854,097, filed on May 11, 2001.

Since the Examiner's rejections for anticipation are improper, as discussed below, the Examiner is respectfully requested to withdraw the rejections and allow claims 1-46.

With respect to anticipation under 35 U.S.C. §102 (b) over Das, as to claims 1, 3-9, 11-21, and 23-46, the Examiner has taken the position that Das:

> teaches a laser chamber (2) containing a laser gas and having two elongated electrodes; a tangential type fan (column 4, lines 65-67) for providing sufficient gas velocities of the laser gas in the discharge region to clear from the discharge region substantially all discharge produced ions prior to the next pulse; a heat exchange system (col1, lines 15-20) capable of removing at least 16 kw of heat energy from the laser gas; a pulse power system (column 1, lines 5-10) configured to provide electrical pulses to the electrodes; and a laser beam measurement and control system (col. 6, lines 10-67) capable of measuring pulse energy wavelength and bandwidth of energy pulses.

Regarding claim 1, Das does not disclose, at least one or more of the following elements found in claim 1, making a rejection under 35 U.S.C. §102 (b) improper:[1]

1. two elongated electrodes, defining a discharge region and having a gas flow path with a gradually increasing cross section downstream of said electrodes to permit recovery of a large percentage of static pressure drop occurring in the discharge region;

2. providing electrical pulses to said electrodes sufficient to produce laser output pulses at rates of up to and above 4,000 laser output pulses per second with precisely controlled pulse energies (as amended); and

3. measuring pulse energy, wavelength and bandwidth of every pulse or substantially every pulse with feedback control of laser output pulse energy and wavelength. (as amended)

As to item 3., this is at least true in the context of the claimed laser operating parameter of up to and above 4000 Hz.

Therefore, the Examiner's rejection of claim 1 under 35 U.S.C. §102 (b) is improper due to the failure of Das to disclose any one or more of items 1-3, and the Examiner is respectfully requested to withdraw the rejection of claim 1 over Das and allow claim 1.

With respect to claim 2, the Examiner has taken the position that Das "teaches the discharge system being a KrF excimer laser system and the laser gas being comprised o Krypton, fluorine and neon."

Claim 2 depends from the allowable claim 1 and should be allowed for that reason. *In re Fine*, 837 F.2d 1071, 5 U.S.P.Q.2d 1596 (Fed. Cir. 1988). Therefore the Examiner's rejection of claim 2 is improper and the Examiner is respectfully requested to withdraw the rejection of claim 2 and allow claim 2.

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[1] Anticipation occurs if "'a prior art reference ... disclose[s] every limitation of the claimed invention, either explicitly or inherently.'" *Mehl/Biophile International Corp. v. Milgraum*, 192 F.3d 1362, 1365, 52 U.S.P.Q.2d 1303, 1305 (Fed. Cir. 1999); *General Electric Co. v. Nintendo*, 179 F.3d 1350, 1356, 50 U.S.P.Q.2d 1910, 1912 (Fed. Cir. 1999) ("anticipation requires that a single prior art reference disclose every limitation in a patent claim."); *Union Oil Co. of California v. Atlantic Richfield Co.*, 208 F.3d 989, 994-95, 54 U.S.P.Q.2d 1227, 1230-31 (Fed Cir. 2000) ("a party seeking to invalidate a patent under §102 [must] show that the allegedly invalidating prior art contains 'each and every element of [the] claimed invention.'"); *Richardson v. Suzuki Motor Co.*, 868 F.2d 1226, 1236, 9 U.S.P.Q.2d 1913,1920 (Fed. Cir. 1989) (quoted in the USPTO Manual of Patent Examining Procedure, ("MPEP"), §2131); *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 U.S.P.Q.2d 1051, 1053 (Fed. Cir. 1987) (quoted in the MPEP, §2131).

With respect to claim 10, the Examiner has taken the position that Das "teaches the finned heat exchanger system is water cooled (column 2, lines 60-65). Claim 10 depends from the allowable claim 1 and should be allowed for that reason. *In re Fine*, 837 F.2d 1071, 5 U.S.P.Q.2d 1596 (Fed. Cir. 1988). Therefore the Examiner's rejection of claim 10 is improper and the Examiner is respectfully requested to withdraw the rejection of claim 10 and allow claim 10.

With respect to claim 22 the Examiner has taken the position that Das:

> teaches the laser beam measurement and control system comprising an etalon, photo diode array, a programmable logic device, and optics to focus laser light from the etalon unit [onto (as in the amended claim)] the photo diode array wherein the programmable logic device is programmed to analyze data from the photodiode array to determine location on the photo diode array of etalon fringes (figure 6; column 6, lines 34-43).

As noted in the specification of the above captioned application:

> The specific details of a preferred algorithm used in this preferred embodiment will now be described. FIG. 14D is a curve with 5 peaks as shown which represents a typical etalon fringe signal as measured by linear photo diode array 180. The central peak is drawn lower in height than the others. As different wavelengths of light enter the etalon, the central peak will rise and fall, sometimes going to zero. This aspect renders the central peak unsuitable for the wavelength measurements. The other peaks will move toward or away from the central peak in response to changes in wavelength, so the position of these peaks can be used to determine the wavelength, while their width measures the bandwidth of the laser. Two regions, each labeled data window, are shown in FIG. 14D. The data windows are located so that the fringe nearest the central peak is normally used for the analysis. However, when the wavelength changes to move the fringe too close to the central peak (which will cause distortion and resulting errors), the first peak is outside the window, but the second closest peak will be inside the window, and the software causes the processor in control module 197 to use the second peak. Conversely, when the wavelength shifts to move the current peak

outside the data window away from the central peak the software will jump to an inner fringe within the data window. The data windows are also depicted on FIG. 14B.

For very fast computation of bandwidth for each pulse at repetition rates up to the range of 4,000 Hz to 6,000 Hz a preferred embodiment uses the hardware identified in FIG. 15. The hardware includes a microprocessor 400, Model MPC 823 supplied by Motorola with offices in Phoenix, Ariz.; a programmable logic device 402, Model EP 6016QC240 supplied by Altera with offices in San Jose, Calif.; an executive and data memory bank 404; a special very fast RAM 406 for temporary storage of photodiode array data in table form; a third 4.times.1024 pixel RAM memory bank 408 operating as a memory buffer; and an analog to digital converter 410.

As explained in U.S. Pat. No. 5,025,446 and U.S. Pat. No. 5,978,394, prior art devices were required to analyze a large mass of PDA data pixel intensity data representing interference fringes produced by etalon 184 an photodiode array 180 in order to determine center line wavelength and bandwidth. This was a relatively time consuming process even with a computer processor because about 400 pixel intensity values had to be analyzed to look for and describe the etalon fringes for each calculation of wavelength and bandwidth. A preferred embodiment of the present invention greatly speeds up this process by providing a processor in the form of [PDA 402 (as in the amended specification)] for finding the important fringes which operates in parallel with the processor [,microprocessor 400, (as in the amended specification)] calculating the wavelength information.

The basic technique is to use programmable logic device 402 to continuously produce a fringe data table from the PDA pixel data as the pixel data are produced. Logic device 402 also identifies which of the sets of fringe data represent fringe data of interest. Then when a calculation of center wavelength and bandwidth are needed, microprocessor merely picks up the data from the identified pixels of interest and calculates the needed values of center wavelength and bandwidth. This process reduces the calculation time for microprocessor by about a factor of about 10.

Specific steps in the process of calculating center wavelength and bandwidth are as follows:

1) With PDA 180 clocked to operate at 2.5 MHz, PDA 180 is directed by processor 400 to collect data at a from pixels 1 to 600 at a scan rate of 4,000 Hz and to read pixels 1 to 1028 at a rate of 100 Hz.

2) The analog pixel intensity data produced by PDA 180 is converted from analog intensity values into digital 8 bit values (0 to 255) by analog to digital converter 410 and the digital data are stored temporarily in RAM buffer 408 as 8 bit values representing intensity at each pixel of photodiode array 180.

3) Programmable logic device 402 analyzes the data passing out of RAM buffer 408 continuously on an almost real time basis looking for fringes, stores all the data in RAM memory 406, identifies all fringes for each pulse, produces a table of fringes for each pulse and stores the tables in RAM 406, and identifies for further analysis one best set of two fringes for each pulse. The technique used by logic device 402 is as follows:

A) PLD 402 analyzes each pixel value coming through buffer 408 to determine if it exceeds an intensity threshold while keeping track of the minimum pixel intensity value. If the threshold is exceeded this is an indication that a fringe peak is coming. The PLD identifies the first pixel above threshold as the "rising edge" pixel number and saves the minimum pixel value of the pixels preceding the "rising edge" pixel. The intensity value of this pixel is identified as the "minimum" of the fringe.

B) PLD 402 then monitors subsequent pixel intensity values to search for the peak of the fringe. It does this by keeping track of the highest intensity value until the intensity drops below the threshold intensity.

C) When a pixel having a value below threshold is found, the PLD identifies it as the falling edge pixel number and saves the maximum value. The PLD then calculates the "width" of the fringe by subtracting the rising edge pixel number from the falling edge pixel number.

D) The four values of rising edge pixel number, maximum fringe intensity, minimum fringe intensity and width of the fringe are stored in the

circular table of fringes section of RAM memory bank 406. Data representing up to 15 fringes can be stored for each pulse although most pulses only produce 2 to 5 fringes in the two windows.

E) PLD 402 also is programmed to identify with respect to each pulse the "best" two fringes for each pulse. It does this by identifying the last fringe completely within the 0 to 199 window and the first fringe completely within the 400 to 599 window.

The total time required after a pulse for (1) the collection of the pixel data, and (2) the formation of the circular table of fringes for the pulse is only about 200 micro seconds. The principal time saving advantages of this technique is that the search for fringes is occurring as the fringe data is being read out, digitized and stored. Once the two best fringes are identified for a particular pulse, microprocessor 400 secures the raw pixel data in the region of the two fringes from RAM memory bank 406 and calculates from that data the bandwidth and center wavelength. The calculation is as follows:

Typical shape of the etalon fringes are shown in FIG. 14D. Based on the prior work of PLD 402 the fringe having a maximum at about pixel 180 and the fringe having a maximum at about pixel 450 will be identified to microprocessor 400. The pixel data surrounding these two maxima are analyzed by microprocessor 400 to define the shape and location of the fringe. This is done as follows:

A) A half maximum value is determined by subtracting the fringe minimum from the fringe maximum dividing the difference by 2 and adding the result to the fringe minimum. For each rising edge and each falling edge of the two fringes the two pixels having values of closest above and closest below the half maximum value. Microprocessor then extrapolates between the two pixel values in each case to define the end points of D1 and D2 as shown in FIG. 18B with a precision of {fraction (1/32)} pixel. From these values the inner diameter D1 and the outer diameter D2 of the circular fringe are determined. (pp. 32-34)

Even if Das mentioned anything in regard to Fig. 6 cited by the Examiner or otherwise, about anything that was programmable, or used a program or a processor,

none of which Das does, it would be at best a microprocessor for making bandwidth calculations. It certainly teaches nothing abut the use of a programmable logic device, as described above and claimed, e.g., in claims 22-25, for the purposes described in the above quoted portion of the Specification, thus serving in part to enable operations at 4000+ Hz laser output pulses.

For the above stated reasons, the Examiner's rejection of claim 22 is improper and the Examiner is respectfully requested to withdraw the rejection of claim 22 over Das and allow claim 22.

The Examiner has not even referenced Das regarding the additional recitations contained in claims 3-9, and 11-21 and 23-46, and rightly so, since none of the additional recitations in those claims can be found in Das. It is also true, that to the extent any of the claims 3-9, 11-21 and 23-46 can be found in Das, such claim would be allowable in any event under *In re Fine*, 837 F.2d 1071, 5 U.S.P.Q.2d 1596 (Fed. Cir. 1988).

The Examiner has made essentially the identical rejection under 35 U.S.C. §102 (e) in regard to Scaggs, respecting the teachings of the art, with the exception of Scaggs teaching the recitations of claims 22. Essentially the identical arguments noted above with respect to Das apply equally as well to the Examiner's rejections of claims 1-46 over Scaggs. Therefore, the Examiner's rejections of claims 1-46 under 35 U.S.C. §102 (e) over Scaggs is improper, and the Examiner is respectfully requested to withdraw the rejections of claims 1-46 and to allow claims 1-46.

The Examiner has made essentially the identical rejection of claims 1-46 under 35 U.S.C.§102 (e) over Stamm as with respect to over Scaggs, and for the same above noted reasons, the Examiner's rejection of claims 1-46 under 35 U.S.C.§102 (e) over Stamm is improper and the Examiner is respectfully requested to withdraw the rejection of claims 1-46 and to allow claims 1-46.

The claims have been amended to correct errors in grammar, syntax or obvious typographical errors (claims 1, 6, 13, 14, 18, 20, 22, 35, 36, and 41) or to provide proper antecedent basis or correct an erroneously stated antecedent basis (claim 7). These amendments are made purely to correct obvious inaccuracies and discrepancies with the other claims as filed and not to define over any prior art, or to narrow the claim, nor is

narrowing of the claim the intent or even the result of these amendments to claims 1, 6, 13, 14, 18, 20, 22, 35, 36 and 41 or to claim 7.

In addition claims 24 and 25 have been amended to correct the recitations in the claim, which do not comport with the disclosure of the specification and other claims as filed, i.e., the claimed PLD in claims 24 and 25 is claimed to be performing the functions of the mioroprocessor. This amendment is made purely to correct this obvious inaccuracy and discrepancy with the specification and other claims as filed and not to define over any prior art, or to narrow the claim, nor is narrowing of the claim the intent or even the result of these amendments to claims 24 and 25.

Also the claim is amended to remove the non-positive recitation "capable of," and similarly claim 1 is amended to remove the similarly non-positive recitation of "configured to." These amendments are based upon comments of other Examiner's having the Examiner's same supervisory Examiner in related cases where the non-positive nature of such recitations has been objected to, and not for the purpose of defining over any art or with the intent or effect of changing the substance and content of the claim in any way, and certainly not in a narrowing way. In the same way and to the same effect claims 25, 39 and 43 have been amended.

Claim 41 has been amended to correct the confusing and/or obviously technically inaccurate recitation that the beam splitter removes "a small percentage of the pulses" as opposed to "a small percentage of the light in each of the output pulses," beam splitters being incapable of the former, if read to mean some pulses but not others, and being operable to perform as the claim currently recites. This purely clarifying amendment is made purely to correct this obvious ambiguity or inaccuracy and not to define over any prior art, or to narrow the claim, nor is narrowing of the claim the intent. Narrowing indeed may not even be the result of this amendment, to the extent the claim before amendment was ambiguous and possibly subject to an incorrect claim construction.

Finally claim 1 has been amended to correct certain possible confusion between "laser output pulses" and "electrical pulses" and to broaden the claim by not specifically referring to 16kw, 5 mJ and by reciting "up to and above 4000 laser output pulses per second" and to recite "movement" as opposed to "velocities".

Claims 1 and 4-46 have been rejected for obviousness double patenting provisionally over application Ser. No. 09/854,097, entitled FOUR KHZ GAS DISCHARGE LASER, filed on May 11, 2001, to which the above captioned application claims priority, and over United States Patent No. 6,477,193, entitled EXTREME REPETITION RATE GAS DISCHARGE LASER WITH IMPROVED BLOWER MOTOR, issued on November 5, 2002.

Applicants have filed Terminal Disclaimers as to 09/854,097 and 6,447,193. Therefore the Examiner's rejection of claims 1 and 4-43 for obviousness double patenting is now improper and the Examiner is respectfully requested to withdraw the rejection of claims 1 and 4-46.

New claims 47-68 have been added to more particularly recite and distinctly claims elements of the present invention which have not before been addressed in the claims and as such are intended to broaden the claims beyond what was recited before, and are not added to define the claims over any prior art any more than the existing claims are already allowable over the prior art, as discussed above.

Claims 1-46 have been rejected under 35 U.S.C. §112, second paragraph, as being indefinite. The Examiner has taken the position that "heat exchanger system" "pulse power system" and "laser beam measurement and control system" are indefinite. Applicants respectfully traverse this rejection. "Heat exchangers" in gas discharge lasers are well known and their function and purpose is well known and it is submitted that the recitation of a "heat exchanger system" will be well understood by those skilled in the art as a system that performs a heat exchanging function in the gas discharge laser and specifically as recited to "remove heat energy from said laser gas" (as in the claim as amended), without the need for additional structural recitations. The same is true for a "pulse power system," as a system providing electrical pulses. The same is true also for a "laser beam measurement and control system," as a system that measures certain parameters and provides feedback control, without the need for additional structural recitations.

The Examiner has taken the position that the phrase "vane structure" is indefinite. The applicants respectfully traverse this rejection. The "vane structure" being claimed is the "vane structure 66" referred to in the Specification and shown, e.g., in Fig. 4A.

For the above stated reasons, the Examiner's rejections of claims 1-46 under 35 U.S.C. §112, second paragraph, are improper and the Examiner is respectfully requested to withdraw the rejections of claims 1-46 under 35 U.S.C. §112, second paragraph, and allow claims 1-46.

Conclusions

For the above stated reasons, Applicants submit that claims 1-46 are now in a condition for allowance along with new claims 47-68 and the Examiner is respectfully requested to withdraw the rejections of claims 1-46 and to allow claims 1-46 along with new claims 47-68.

Applicants' authorize the Commissioner to charge our Deposit Account No. 03-4060 in the total amount of $580.00; $220.00 for the two terminal disclaimer fees and $360.00 for the additional claims fee. Applicants do not believe any other fees are due in connection with this submission, however, if any fees are required, the Commissioner is authorized to charge any fees, or to credit any overpayment to our Deposit Account No. 03-4060.

Respectfully submitted,

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